International regulation of audit quality: full harmonization or mutual recognition? An economic approach

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ABSTRACT

The market for audit services is modelled as a market with vertical product differentiation, rigid demand, third-party externalities and a liability rule. This framework is used to choose between full harmonization and mutual recognition as possible international regulatory regimes for audit quality. It is shown that if third-party externalities are zero, then full harmonization is at least as good as mutual recognition. If, however, externalities are not zero, then mutual recognition can yield a higher level of social welfare than full harmonization. These results are relevant for the debate on the international regulation of the provision of audit services, especially within the EU, and show that full harmonization is not necessarily the best option.

1. INTRODUCTION

The aim of this paper is to compare the regimes of full harmonization (FH) and mutual recognition (MR) as possible international regulatory regimes for quality control in the market for audit services. In an FH regime the same minimum requirements for professional qualifications and the same auditing standards are imposed in all the countries involved.[1] Alternatively in an MR regime different countries mutually recognize foreign qualifications and foreign standards so that an officially qualified foreign auditor can conduct the audit of a local company following the standards in place in its country of origin.

The EU has issued directives on both professional training for auditors and mutual recognition of higher education professional diplomas. However, the national states may require an administrative check of the curriculum followed by

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the foreign auditor in order to qualify, before they recognize foreign qualifications and the foreign auditor is often *de facto* required to make up for any difference in the training between Member States. Given the obvious political difficulties involved in reaching the international agreement necessary to implement an FH regime, it is not surprising that EU directives include elements of an MR regime. So it is fair to ask whether an MR regime is simply an inferior but attainable arrangement when compared to the ideal FH regime.

In what follows I compare, from an economic perspective, the welfare effects of the two alternative regimes (FH and MR) for the setting of minimum quality standards (MQS) for audit and I will show that, contrary to a popular common belief and under some particular conditions, MR can be superior to FH.

The choice of the particular economic model used was inspired by the observation of the following peculiar features of the market for audit services: rigid demand (audit is mandatory for many companies), the presence of positive externalities (the effects on the so called 'third party users') and producers' liability (auditors may be sued if the company gets into financial distress).[2]

By looking at these features of the market for audit services, it seems sensible to model competition in this market as taking place in the price quality space rather than in the price quantity space. Audit firms can offer to each company a better audit for a cheaper price, but they do not offer more audits for the same price.

The analysis shows that the choice between FH and MR as possible interna tional regulatory regimes for audit quality control depends, in general, on the existence of some strong demand for higher levels of quality of the service produced. More specifically, when the features of the audit market are taken into account, third party externalities appear to be crucial. When these externalities are not taken into account, then FH is equivalent or superior to MR. However, when these externalities are considered, then MR can be superior to FH.

The paper is organized as follows. Section 2 reviews the related literature in order to point out what is the original contribution of the analysis. Section 3 presents the general version of the economic model used here and uses it to explain the intuition behind the results of the paper. Section 4 considers a specific version of the model that captures some of the features of the market for audit services and derives the main results of the paper. Section 5 draws some conclusions.

2. RELATED LITERATURE

Two strands of literature are brought together in this paper. On one side we have the economic literature on minimum quality standards (e.g. Ronnen, 1991; Crampes and Hollander, 1995; Ecchia and Lambertini, 1997; Cremer *et al.*, 1997; Boom, 1995; and Lutz, 1996). With respect to this strand of literature, this paper is innovative for two reasons: first, it introduces rigid demand and a liability rule in a model of vertical product differentiation; second, it introduces third party externalities in the analysis of international quality regulation.

On the other side we have the literature on auditors' liability and auditors' quality choice (e.g. Dye, 1993a, 1993b; Narayanan, 1994; Willekens *et al.*, 1996). All these papers focus on the case of one auditor auditing one client. They address neither the issue of quality driven competition for bigger market shares, nor the international side of the regulation. The model presented here takes explicitly into account market share competition and international regulation.

Chan *et al.* (1998) also model the market for audit services as a market with product differentiation. However, they consider *horizontal* product differentiation and study industry specialization effects and do not address the regulation issue. The model presented here introduces *vertical* product differentiation into the analysis of the market for audit services.

3. A GENERAL MODEL

I consider the case of two countries having to decide how to regulate quality in the audit industry at an international level. An auditor can sell an audit to each individual client. The audit is identified by its quality $q \in [0, \infty)$.

Audit quality regulation can affect directly the observable components of audit quality, i.e. minimum professional qualification and minimum standards of conduct. Hence the object of the analysis here are all the observable components of audit quality that can be ordered in terms of their strictness so that a set of standards can be defined as more or less demanding than another. So *ex ante* audit quality is assumed to be observable by the client in the sense that the client can observe professional qualifications and declared standards of conduct of the audit firm.[3]

We can describe clients' preferences (the utility derived from an audit of quality q) using the function

$$U(q, p; \theta) \tag{1}$$

where p is the price/fee paid for the audit and θ is a parameter that captures the client specific willingness to pay for *ex ante* audit quality. I assume that the benefit clients extract from having their accounts audited differs among them and that this is reflected in different preferences for the same combination of quality and price.[4] This difference in preferences is captured by the parameter θ.

I assume that there is only one auditor in each of the two countries. If the two auditors decide to provide different levels of quality, then we will have a high quality auditor and it will be labelled with the subscript h, and a low quality auditor that will be labelled with the subscript l. Following the economic literature on the argument, I assume that the distribution of roles between the two auditors (*high* and *low*) is given and that each auditor offers only one quality. Any perspective client, no matter which country he resides in, can decide to hire either the home or the foreign auditor. So in both countries we will have clients buying high quality audits and clients buying low quality audits.

Audit technology is the same for both auditors. There is a cost $m(q; \mathbf{a})$ of conducting an audit, which I assume is a function of the quality of the audit provided and of a vector of parameters $\mathbf{a}$. All the effects that can be traced back to audit quality are captured by the direct dependence on q of the function $m(\cdot)$ and will be endogenous in our model. All the other effects are captured by the vector of parameters $\mathbf{a}$ and will be exogenous.

I will call x_i ($i \quad h, l$) the number of clients that each of the two auditor manages to have. Hence the profit earned by each auditor will be

$$\pi_i \quad [p_i \quad m(q_i; \mathbf{a})]x_i \tag{2}$$

Given the combination of quality and fee (q_h, p_h) and (q_l, p_l) offered by the two auditors and the distribution $f(\theta)$ of the parameter θ, using standard profit maximization techniques we can solve the price stage of the game and we can represent the problem in the quality space as follows:

$$\pi_h \quad \pi_h(q_h, q_l; \mathbf{a}) \tag{3a}$$

$$\pi_l \quad \pi_l(q_h, q_l; \mathbf{a}) \tag{3b}$$

$$CS_h \quad CS_h(q_h, q_l; \mathbf{a}) \tag{4a}$$

$$CS_l \quad CS_l(q_h, q_l; \mathbf{a}) \tag{4b}$$

where CS_i is the consumer surplus earned by clients buying audit of quality i. This is the formulation of the problem I will use in the rest of the analysis.

3.1. Unregulated equilibrium

I start by depicting the equilibrium when no regulatory restrictions are imposed on quality choice. In this case equilibrium quality levels are determined by maximizing simultaneously the profit functions of the two auditors, i.e.

$$\max_{q_h} \pi_h(q_h, q_l; \mathbf{a}) \rightarrow \frac{\partial \pi_h(q_h, q_l; \mathbf{a})}{\partial q_h} \quad 0 \rightarrow q_h^*(q_l; \mathbf{a}) \tag{5a}$$

$$\max_{q_l} \pi_l(q_h, q_l; \mathbf{a}) \rightarrow \frac{\partial \pi_l(q_h, q_l; \mathbf{a})}{\partial q_l} \quad 0 \rightarrow q_l^*(q_h; \mathbf{a}) \tag{5b}$$

Equations (5a) and (5b) determine what are usually called the *reaction* functions of the two auditors. These functions determine the optimal quality choice for each possible level of quality chosen by the rival. Figure 1 depicts these two reaction functions for a standard specification of the general model analysed so far.

The crossing of the two functions is the unregulated quality equilibrium. The position of the unregulated equilibrium will depend on:

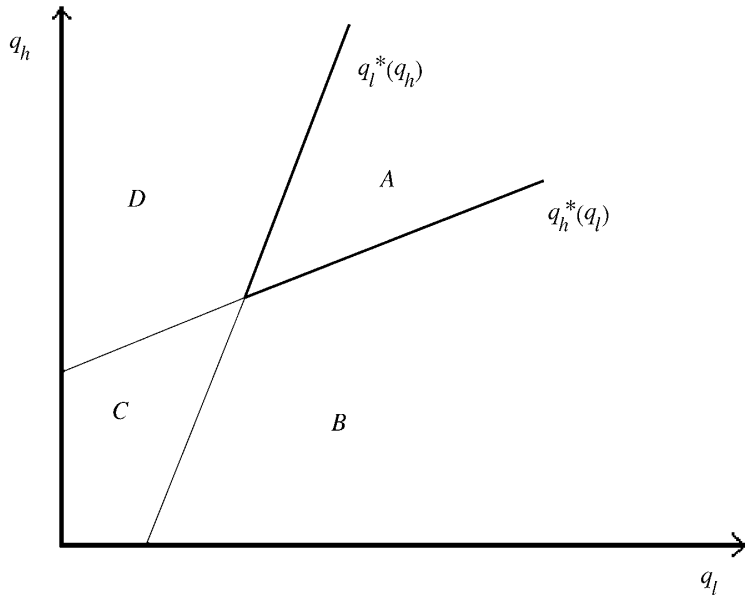

Figure 1 Auditors' reaction functions in the quality space.

- the functional form of the profit functions and the value of the vector of parameters **a**;
- the functional form of clients' preferences and the distribution assumed for the parameter θ.

3.2. Regulated equilibrium

I will consider the case of regulation through the imposition of minimum quality standards (MQS). An MQS is a minimum level of quality that has to be provided in order to be allowed to operate. In other words, when an MQS is in place, no quality levels below the MQS can be offered by an auditor.

Following a standard economic approach I will rank different social outcomes through a social welfare function. For the time being I will adopt the following very general formulation:

$$W^G(\pi_h(q_h, q_l; \mathbf{a}), \pi_l(q_h, q_l; \mathbf{a})_l, CS(q_h, q_l), E(q_h, q_l; \mathbf{z})) \quad W^G(q_h, q_l; \mathbf{a}, \mathbf{z}) \quad (6)$$

Social welfare depends on the welfare of auditors (i.e. their profits), on the welfare of the clients ($CS \quad CS_h + CS_l$) and on the welfare of third party users of audit

reports, $E(q_h, q_l; \mathbf{z})$, which I assume will depend on the quality mix and on a vector of parameters $\mathbf{z}$. E does not depend on p_h and p_l because third parties do not pay for the audit report they use.

The superscript G indicates that this is *global* social welfare, in the sense that it includes both countries. We can then define national social welfare functions in an analogous way. However, we have to take into account that only some of the third party users, only one auditor and that only part of the clients of each auditor will be located in each country. Hence we have:

$$W^h(\pi_h(q_h, q_l; \mathbf{a}), CS^h(q_h, q_l), E^h(q_h, q_l; \mathbf{z})) \quad W^h(q_h, q_l; \mathbf{a}, \mathbf{z}) \tag{7a}$$

$$W^l(\pi_l(q_h, q_l; \mathbf{a}), CS^l(q_h, q_l), E^l(q_h, q_l; \mathbf{z})) \quad W^l(q_h, q_l; \mathbf{a}, \mathbf{z}) \tag{7b}$$

where the superscripts indicate the country. Country labelling depends on the quality provided by the resident auditor (e.g. country h is the country of the high quality auditor). Obviously we will have

$$W^h + W^l \quad W^G \tag{8a}$$

$$CS^h + CS^l \quad CS \tag{8b}$$

$$E^h + E^l \quad E \tag{8c}$$

3.2.1. *Full harmonization*

In an FH regime a unique MQS is imposed on both countries. I assume that the regulator is benevolent so that the optimal level of the MQS is decided using *global* social welfare as the criterion. In an FH regime it is not possible to influence directly the high end of the quality mix. Once the MQS is imposed this acts as a lower bound on quality choice and affects directly the quality choice of the low quality auditor. Then high quality will always be determined by the reaction function of the high quality auditor, given that high quality is by definition above low quality and consequently must be greater than or equal to the unique MQS.

The intuition can be visualized by referring again to Figure 1. Under FH the social planner cannot maximize social welfare freely in the quality space. He has to take into account that high quality will always be determined by the reaction function of the high quality auditor. Hence the FH equilibrium will be located along the reaction function of the high quality auditor and, given that the regulator is assumed to be benevolent, this equilibrium will achieve the maximum level of global social welfare along this line. Notice now that the unregulated equilibrium is also, by definition, located along the reaction function of the high quality auditor. If the maximum of the global social welfare function were to the left of the unregulated equilibrium, then there would be no room for the imposition of

minimum quality requirements and a quality cap should be used. Given that quality caps do not seem to be common practice in audit quality regulation, this case will not be considered here. Hence, if an MQS is imposed under an FH regime, then it must be that the maximum attainable level of global social welfare must be on the right of the unregulated equilibrium. So I can now state the following.

Lemma 1 (FH versus unregulated equilibrium). *If an MQS is imposed under an FH regime, then the level of global social welfare in the FH regime must be greater than the level of global social welfare that would be obtained with no regulation.*

Proof. Directly from the previous argument and the assumption of a benevolent regulator. *Q.E.D.*

3.2.2. Mutual recognition

In an MR regime both countries can impose their own MQS which obviously will be binding only for their domestic auditor. However, these possibly different standards are mutually recognized in the sense that a foreign auditor can conduct an audit of a home company according to the standards in place in the foreign country. So a home prospective client can choose between hiring the home auditor and so choose the home level of quality assurance or hiring the foreign auditor and therefore the foreign level of quality assurance.

The main difference between an FH and an MR regime resides in the fact that in MR *both* quality levels (low and high) can be *directly* manipulated through regulation. Regulation in the country of the high quality auditor can directly affect high quality choice and not only through the optimal reaction of the high quality auditor to low quality regulation, as was the case in the FH regime.

Assuming again benevolent regulators, the optimal level of national MQS will be determined by looking at *national* welfare functions and taking into account the quality level chosen by the foreign auditor. Obviously national MQS can be effective only if they are set *above* the quality level that would be chosen freely by the national auditor. If we refer again to Figure 1, this means that a national MQS for the country of the high quality auditor, if it is implemented, has to be set *above* the reaction function of the high quality auditor. In the same way a national MQS for the country of the low quality auditor has to be set to the right of the reaction function of the low quality auditor. Consequently, the quality mix implemented in an MR regime has to be located in the *A* region of Figure 1.

We are now ready to understand why an MR equilibrium can yield a level of global social welfare greater than the level obtained in an FH equilibrium. The FH equilibrium is a maximum of the global social welfare function, but it is a *constrained* maximum, i.e. it has to be located along the reaction function of the high quality auditor and it is not the *global* maximum of the global social welfare

function. There is absolutely no reason why a quality mix located within region A or along the best reaction function of the low quality auditor can not be associated with a level of global social welfare higher than the constrained maximum implemented through FH.

A first necessary condition for MR to dominate FH is the following: the high quality audit country must have a national interest in raising the level of quality of national auditors above the level determined by the free decision of the national (high quality) auditor.

Analytically, the national optimal level of high quality will be determined by the national welfare function and in particular by the sign of its derivative w.r.t. q_h, i.e.

$$\begin{aligned}\frac{\partial W^h(q_h, q_l; \mathbf{a}, \mathbf{z})}{\partial q_h} \quad & \frac{\partial W^h(q_h, q_l; \mathbf{a}, \mathbf{z})}{\partial \pi_h}\frac{\partial \pi_h(q_h, q_l; \mathbf{a})}{\partial q_h} \\ & + \frac{\partial W^h(q_h, q_l; \mathbf{a}, \mathbf{z})}{\partial CS^h}\frac{\partial CS^h(q_h, q_l; \mathbf{a})}{\partial q_h} \\ & + \frac{\partial W^h(q_h, q_l; \mathbf{a}, \mathbf{z})}{\partial E^h}\frac{\partial E^h(q_h, q_l; \mathbf{z})}{\partial q_h} \end{aligned} \tag{9}$$

Along the reaction function of the high quality auditor we know that condition (5a) must be verified. Moreover, an MQS will be implemented only if the quality chosen freely by the auditor is too small, i.e. only if the derivative of the national social welfare function, calculated along the reaction function of the high quality auditor, is positive. This gives us the following *necessary* condition for MR to be effective and possibly superior to FH:

$$\begin{aligned}\left.\frac{\partial W^h(q_h, q_l; \mathbf{a}, \mathbf{z})}{\partial q_h}\right|_{(\partial \pi_h/\partial q_h)\ 0} \quad & \left.\frac{\partial W^h(q_h, q_l; \mathbf{a}, \mathbf{z})}{\partial CS^h}\frac{\partial CS^h(q_h, q_l; \mathbf{a})}{\partial q_h}\right|_{(\partial \pi_h/\partial q_h)\ 0} \\ & + \left.\frac{\partial W^h(q_h, q_l; \mathbf{a}, \mathbf{z})}{\partial E^h}\frac{\partial E^h(q_h, q_l; \mathbf{z})}{\partial q_h}\right|_{(\partial \pi_h/\partial q_h)\ 0} \\ & > 0 \end{aligned} \tag{10}$$

Given that we can assume that social welfare depends positively on clients and third party utility, i.e.

$$\begin{aligned}\frac{\partial W^h(q_h, q_l; \mathbf{a}, \mathbf{z})}{\partial CS^h} > 0 \\ \frac{\partial W^h(q_h, q_l; \mathbf{a}, \mathbf{z})}{\partial E^h} > 0 \end{aligned} \tag{11}$$

condition (10) has a fairly straightforward interpretation. An MR regime can be superior to an FH regime in only one of the following two situations.

Case 1

$$\left.\frac{\partial CS^h(q_h, q_l; \mathbf{a})}{\partial q_h}\right|_{(\partial \pi_h/\partial q_h)\ 0} > 0$$
$$\left.\frac{\partial E^h(q_h, q_l; \mathbf{z})}{\partial q_h}\right|_{(\partial \pi_h/\partial q_h)\ 0} > 0 \tag{12}$$

In this case both clients and third parties of the high quality country are not happy with the quality level provided freely by the national auditor. We could have this situation when a small developed country is negotiating with a large less developed country. The high quality auditor is likely to be located in the small developed country. The global demand for very high quality audit services is too low and the high quality auditor chooses its quality in order to compete with the low quality foreign auditor in the large foreign market. This situation may create an under provision of high quality that is likely to be perceived strongly in the small developed country.

Case 2

If clients and third parties of the high quality country do not agree on the need to raise high quality, then condition (10) can be read as follows:

$$\frac{\partial W^h(q_h, q_l; \mathbf{a}, \mathbf{z})}{\partial E^h} \left.\frac{\partial E^h(q_h, q_l; \mathbf{z})}{\partial q_h}\right|_{(\partial \pi_h/\partial q_h)\ 0}$$
$$> \frac{\partial W^h(q_h, q_l; \mathbf{a}, \mathbf{z})}{\partial CS^h} \left.\frac{\partial CS^h(q_h, q_l; \mathbf{a})}{\partial q_h}\right|_{(\partial \pi_h/\partial q_h)\ 0} \tag{13}$$

Given that third parties do not pay directly for quality it is reasonable to assume that

$$\left.\frac{\partial E^h(q_h, q_l; \mathbf{z})}{\partial q_h}\right|_{(\partial \pi_h/\partial q_h)\ 0} > 0 \tag{14}$$

This means that third parties in the high quality country want to see a higher level of high quality, whereas clients in the high quality country want to see a decrease in high quality. Then condition (13) can be satisfied only if third party welfare is relatively more important than clients' welfare. This situation is probably more likely when two similar countries are negotiating. In this case there could be a general interest in securing a fairly high minimum level of quality, but not necessarily a very different level of high quality. A decrease in high quality reduces the difference between the service provided by the high quality auditor and the service provided by the low quality auditor. This reduction increases price competition and lowers audit fees, with an obvious advantage for clients and a possible disadvantage for third parties.

We can summarize the previous argument as follows.

Lemma 2 (FH versus MR). *The comparison between MR and FH in terms of global welfare depends crucially on the welfare of clients and third parties of the country of the high quality auditor.*

If both clients and third parties of the high quality audit country do not want to see a rise in audit quality above the level already provided by the national auditor, then FH is always the best regime in terms of global social welfare.

If both clients and third parties of the high quality audit country agree on the need to raise audit quality, then MR can yield a level of global social welfare higher than FH.

If, on the other hand, clients and third parties do not agree, MR can dominate FH only if, in the national welfare function, third parties are relatively more important than clients.

Proof. Directly from the previous argument. *Q.E.D.*

Notice the generality of the results so far. In order for them to hold we just need some standard regularity conditions.[5] The possible superiority of MR is based on a general economic argument summarized mathematically by condition (10) and more intuitively by Lemma 2. This superiority does not depend on any special assumption about the size of the countries, liability regimes, clients demand distribution and so on. The generality of condition (10) and Lemma 2 allows us to highlight the basic economic intuition behind the result. MR can be superior to FH when clients and/or third parties have a preference for differentiation in the supply of audit services and this preference is strongly perceived by national regulators of the high quality audit country. In this case FH is a limited regulatory regime because it affects directly only the lower end of the market and tends to reduce product differentiation.

In order to explore the implications of such a result further we need to specify the model more precisely and this is what is done in the following section.

4. A FULLY SOLVED MODEL OF THE MARKET FOR AUDIT SERVICES

4.1. The auditors

I start by specifying the behaviour of the audit firms. The physical cost of each audit depends on the quality chosen and is given by $C(q)$. I assume

$$C'(q) > 0 \quad \text{with } C(0) \quad 0 \tag{15}$$

The intuition is as follows. The cost of each audit performed depends on the particular samples used, the number of accounts checked, the number of partners and staff dedicated to each audit, and the number of days spent with the client. A

higher quality audit will use larger samples, will check more accounts and will assign more partners to the task. Consequently the cost of each audit increases in the level of *ex ante* quality provided.

In addition to the physical cost of producing an audit there is an expected liability cost associated with each audit performed. It depends on quality and is determined by the function

$$L(q) \quad s \cdot \eta(q) D(q) \tag{16}$$

The intuition is as follows. Users of accounts utilize the audit report, while taking their decisions and they can incur losses. s is the joint probability that the client fails and its financial statements are misstated. When these two events occur together, the auditor is called into court and can be held liable for the losses suffered by third parties.

The marginal cost of each case depends on the probability of being held liable $\eta(q)$. I assume the following:

$$\lim_{q \to +\infty} \eta(q) \quad 0 \quad \lim_{q \to 0} \eta(q) \quad 1 \tag{17a}$$

$$\eta'(q) < 0 \tag{17b}$$

In words, higher audit quality decreases the probability of being held liable in court. When the auditor is judged liable for the losses, it has to pay a sum $D(q)$. $D(q)$ can be a constant (joint and several liability regime) or a decreasing function (proportional liability regime)[6] of q. I will call $s \cdot D(0) \quad \overline{D}$, the maximum expected liability payment that can be sustained by an auditor for each audit when quality is 0.

The total expected cost of each single audit of quality q becomes

$$[C(q) + s \cdot \eta(q) \cdot D(q)] \quad m(q) \tag{18}[7]$$

Given the assumptions made on the behaviour of $C(q)$ and $L(q)$, it must be that

$$\lim_{q \to 0} m(q) \quad \lim_{q \to 0} C(q) + \lim_{q \to 0} L(q) \quad \overline{D} \tag{19a}$$

$$\lim_{q \to +\infty} m(q) \quad \lim_{q \to +\infty} C(q) + \lim_{q \to +\infty} L(q) \quad +\infty \tag{19b}$$

In order to obtain closed form solutions, in the following analysis I will assume that $m(q)$ has the quadratic form:

$$m(q; \mathbf{a}) \quad aq^2 \quad bq + \overline{D} \quad \text{with } \mathbf{a} \quad (a, b, \overline{D}) \text{ and } b^2 \leqslant 4a\overline{D}[8] \tag{20}$$

Parameter a captures the physical dimension of audit cost because it is the parameter that makes audit cost rise with quality as assumed in equation (15). Parameter b captures the liability dimension of audit cost. Absent any liability, then low quality auditors would not have any incentive to provide a quality level other than the minimum.[9] Hence, in order to capture the liability effect through the cost function of the auditor we need to use a cost function that is, at least for a certain range, decreasing in quality.[10]

I will assume that b is the same for both auditors no matter which country they are based in. This does not imply that the liability regime has to be the same in both countries. We could assume a different b for each country and show that, through a change of variables, this case is perfectly equivalent to the case of identical b's.[11]

4.2. The countries, clients' distribution and demand functions

In order to keep the model tractable, I will consider two identical countries. Each country has exactly half of the prospective clients, and they are uniformly distributed[12] from θ 0 to θ t. Hence, in each country the density is equal to $1/t$, but the total number of possible clients is normalized to $\frac{1}{2}$.

Client preferences are described by the following function:[13]

$$U(q, p; \theta) \quad \theta q \quad p \tag{21}$$

Assumption 1. *Each client must buy one audit.*

Assumption 1 captures the idea that audit is mandatory for a certain class of companies and within this class there are companies that would not buy the audit if it were not mandatory.[14] In each country, the market is split between the two auditors. For any given p_h and p_l, in order to determine the number of clients for each auditor, we only have to find $\hat{\theta}$ such that:

$$\hat{\theta} q_h \quad p_h \quad \hat{\theta} q_l \quad p_l \Rightarrow \hat{\theta} \quad \frac{p_h \quad p_l}{q_h \quad q_l} \tag{22}$$

Then the clients with $\theta > \hat{\theta}$ will be audited by the high quality audit firm, whereas the remaining clients will be audited by the low quality audit firm. Hence, equilibrium demands for the high quality auditor (x_h) and for the low quality auditor (x_l) are as follows:

$$x_h(p_h, p_l, q_h, q_l) \quad \int_{\hat{\theta}}^{t} \frac{1}{t} \mathrm{d}\theta \quad \frac{1}{t}(t \quad \hat{\theta}) \quad \frac{1}{t}\left(t \quad \frac{p_h \quad p_l}{q_h \quad q_l}\right) \tag{23a}$$

$$x_l(p_h, p_l, q_h, q_l) \quad \int_{0}^{\hat{\theta}} \frac{1}{t} \mathrm{d}\theta \quad \frac{1}{t}\hat{\theta} \quad \frac{1}{t}\frac{p_h \quad p_l}{q_h \quad q_l} \tag{23b}$$

Standard profit maximization at the price stage allows us to express the relevant equations as follows:

$$\pi_h(q_h, q_l; \mathbf{a}) \quad \frac{1}{9t}(q_h \quad q_l)[2t \quad a(q_h + q_l) + b]^2 \tag{24a}$$

$$\pi_l(q_h, q_l; \mathbf{a}) \quad \frac{1}{9t}(q_h \quad q_l)[t + a(q_h + q_l) \quad b]^2 \tag{24b}$$

$$CS_l(q_h, q_l; \mathbf{a}) \quad \frac{\begin{array}{l}[a(q_l + q_h) \quad b + t](aq_lq_h \quad 3aq_l^2 + 3bq_l + 3tq_l \quad 2aq_h^2 \\ \qquad\qquad + 2bq_h \quad 6\overline{D} \quad 2tq_h)\end{array}}{18t} \tag{25a}$$

$$CS_h(q_h, q_l; \mathbf{a}) \quad \frac{\begin{array}{l}[b + 2t \quad a(q_l + q_h)](aq_lq_h \quad 3aq_h^2 + 3bq_h \quad 2aq_l^2 \\ \qquad\qquad + 2bq_l \quad 6\overline{D} + 4tq_l)\end{array}}{18t} \tag{25b}$$

4.3. Unregulated equilibrium

From the profit functions we can derive the auditors' reaction functions in the quality space:

$$q_h^*(q_l; \mathbf{a}) \quad \frac{2t + b}{3a} + \frac{1}{3}q_l \tag{26a}$$

$$q_l^*(q_h; \mathbf{a}) \quad \frac{t + b}{3a} + \frac{1}{3}q_h \tag{26b}$$

Solving the system of equations (26a) and (26b), remembering that $q_h,\ q_l \geqslant 0$, we get:

$$q_h^U \quad \begin{cases} \dfrac{2t + b}{3a} & \text{if } 0 \leqslant b \leqslant \dfrac{t}{4} \\ \dfrac{b}{2a} + \dfrac{5t}{8a} & \text{if } b > \dfrac{t}{4} \end{cases} \tag{27a}$$

$$q_l^U \quad \begin{cases} 0 & \text{if } 0 \leqslant b \leqslant \dfrac{t}{4} \\ \dfrac{b}{2a} \quad \dfrac{t}{8a} & \text{if } b > \dfrac{t}{4} \end{cases} \tag{27b}^{15}$$

The advantage of this specific version of the model with respect to the general version presented in the previous section, is the possibility of explicitly observing

the effect that the liability regime has on quality choice. The stronger is the incentive effect of the liability system (the higher is b), the higher is the level of quality offered by both auditors. Moreover, we can appreciate how demand condition in the market for audit services interacts with liability consideration. As we can see from (27b) the quality level chosen by the low quality auditor can be at the minimum, i.e. zero. Its level is determined by the relative magnitude of the following two contrasting effects.

(a) **The rigid demand effect**. Demand is rigid in the sense of Assumption 1. Consequently the low quality auditor will have a share of the market no matter the level of quality chosen. All clients who would have not bought an audit, if it was not mandatory, will in principle buy the audit from the low quality auditor no matter what is the actual level of quality offered. Given that quality has a material cost, this effect will dictate a quality level as low as possible, i.e. 0.
(b) **The liability incentive effect**. To choose a low level of quality is risky because of the possible liability payments. Hence the liability effect dictates an increase in the level of quality. Expression (27b) tells us that if the liability effect is sufficiently strong with respect to the width of the taste range, then the liability effect dominates the rigid demand effect and also the low quality auditor chooses a level of quality other than the minimum.

For a graphical representation of this equilibrium we can use again Figure 1. An increase in b (tougher liability) would shift both reaction functions inwards, i.e. it would raise both auditors' quality levels. On the other hand, an increase in t (bigger overall market), would shift the reaction function of the high quality auditor upwards (higher level of quality) and the reaction function of the low quality auditor leftwards (lower level of quality). This would generate a greater differentiation with a lower level of quality at the lower end of the market. This is intuitively correct because an increase in t generates greater demand at both ends of the market. There is more 'rigid' demand at the lower end of the market and this generates the decrease in low quality level, but there is also more demand at the upper end of the market and this generates the increase in the high quality level.

4.4. Regulated equilibrium with no third-party effects

As we know from the general analysis conducted in the previous section, the key elements in the comparison between FH and MR are clients' welfare (CS), third party welfare (E), how they are distributed between countries and how they are weighted in the social welfare function.

Equations (25a) and (25b) give us the global welfare of low quality and high quality clients. Given that I am considering the symmetric countries case, clients will be equally split between the two countries, i.e.

$$CS^{i}(q_h, q_l; \mathbf{a}) \quad \tfrac{1}{2} CS_h(q_h, q_l; \mathbf{a}) + \tfrac{1}{2} CS_l(q_h, q_l; \mathbf{a}) \quad i \quad h, l \tag{28}$$

Following the spirit of the symmetric case I will also assume that auditors and clients are equally weighted in the social welfare function and, for the sake of simplicity, we assume this weight to be the unity, i.e.

$$\frac{\partial W^{i}}{\partial \pi_j} \quad \frac{\partial W^{i}}{\partial CS^{j}} \quad 1 \quad i \quad G, h, l \quad j \quad h, l \tag{29}$$

To understand the crucial role played by third party effects, we begin by analysing the case of no third party effects, i.e. $E \quad 0$ and/or $\partial W^{i}/\partial E^{j} \quad 0$.

In this case the following is true.

Proposition 1. *If third party externalities are not relevant or they are not considered by the regulator, then under an MR regime auditors are not constrained in their choice of quality, i.e.* $q_l^{MR} \quad q_l^{U}$ *and* $q_h^{MR} \quad q_h^{U}$. *The highest social welfare is reached under an FH regime, i.e.*

$$W(q_l^{FH}, q_h^{FH}) > W(q_l^{U}, q_h^{U}) \quad W(q_l^{MR}, q_h^{MR})$$

Proof. The mathematical proof can be found in the Appendix. Intuitively, the proof shows that in the relevant range, the necessary condition (10) for MR to dominate FH is not satisfied. *Q.E.D.*

The intuition behind Proposition 1 is fairly simple. Clients at the upper end of the market are not interested in raising the level of the high quality audit services already provided in the market. An increase in high quality audit services would come at the cost of higher fees, and clients' preference for high quality is not strong enough to compensate for such an increase. The model without third party effects is represented in Figure 2.

This figure is similar to Figure 1, but it includes the reaction function of national regulators ($MQS_i^{*}(q_j)$, $i \neq j$; $i, j \quad h, l$). As we can see these regulator reaction functions lie above the corresponding reaction function of the national auditors for only relatively low levels of quality. When they cross the reaction function of the national auditor, then MR becomes ineffective because the level of quality provided by the national auditor is above the national social optimum. Hence, in this particular case the unregulated equilibrium (U) coincides with the mutual recognition equilibrium (MR). However, from a global point of view the unregulated level of low quality is too low and an FH regime would improve on

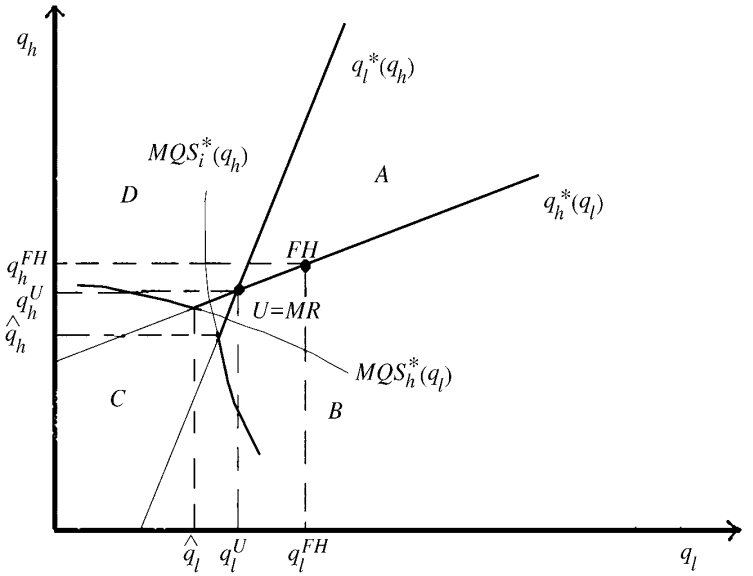

Figure 2 Equilibrium when $E = 0$.

this situation by raising low quality above the unregulated level. For MR to play a role, we need to introduce third party effects.

4.5. Regulated equilibrium with third-party effects

The number of legal cases based on alleged third party liability of the auditor brought to court in the recent past proves the importance of 'third party effects' in the audit contract.[16] The willingness to take explicit account of these relationships is the reason for introducing the externality term into the welfare functions of the model considered here.

In order to be able to go beyond the general result stated in Lemma 2 we need to give an explicit expression to condition (10). For this reason we need to provide an explicit expression for third party welfare. I will consider two possible expressions in sequence.

4.5.1. Weighted average of audit quality

I will first assume that third party welfare is a linear function of the weighted average of the audit quality provided in the market. The weights are given by the share of the total number of clients served by each auditor. In the model considered here these shares coincide with the optimal market demands for

quality derived previously in equations (23a) and (23b). Hence the first extern ality expression I consider is the following:

$$E(q_h, q_l; \mathbf{z}) \quad z[x_l q_l + x_h q_h] \tag{30}$$

Given the symmetric countries assumption third party effects will be equally split between the two countries, i.e.

$$E^i \quad \tfrac{1}{2}E \quad i \quad h, l \tag{31}$$

Finally, I assume that

$$\frac{\partial W^i}{\partial E^i} \quad 1 \quad i \quad h, l \tag{32}$$

We are now able to express equation (10) as follows:

$$\left.\frac{\partial W^h(q_h, q_l; \mathbf{a}, \mathbf{z})}{\partial q_h}\right|_{(\partial \pi_h / \partial q_h) \ 0} \quad \frac{b(t+z) \quad 2aq_l(t+z) + t(2z \quad 7t)}{9t} > 0 \tag{33}$$

It has been impossible to find a set of numerical values for the parameters such that the welfare under MR is above the welfare under FH.[17] This is intuitively reasonable. If third party welfare enters the welfare function in the way described by equation (30), the lower quality end of the market dominates. The reason is as follows. Any minimum quality regulatory intervention in the market will raise the level of low quality offered by the low quality auditor. This will favour the low quality auditor because some of the clients that previously chose the high quality auditor because the low quality offered was *too* low, will now shift and choose the low quality auditor. This shift will cause an increase in the share of the market covered by the low quality auditor and, consequently, a decrease in the share of the market covered by the high quality auditor in both countries. But when this happens, then equation (30) tells us the third party users of the high quality auditor becomes less important as their weight in the externalities function decreases. So it is not surprising that MR is not an interesting regime, because the upper end of the market loses importance and, following condition (10), we know that MR is an effective regime only when the upper end of the market plays a strong role in terms of social welfare.

4.5.2. Modified weighted average of audit quality

Let us now turn our attention to an alternative specification of the externalities expression. Given that the key factor is the relative importance of the upper and lower end of the market, I will now introduce explicit welfare coefficients for these two components of the externalities function, i.e.

$$E(q_h, q_l; \mathbf{z}) \quad z[\omega_l x_l q_l + \omega_h x_h q_h] \tag{34}$$

Given that the market share effect of regulation just described in the previous section tends to favour the lower end of the market, it is interesting to study a case

where the welfare coefficients ω_l and ω_h counterbalance this effect, i.e. they are inversely proportional to market shares. So I assume

$$\omega_i \quad \frac{1}{2x_i} \quad i \quad h, l \tag{35}$$

which means that if the share of the market covered by the low quality auditor rises, then the regulator becomes relatively less concerned with this part of the market for audit services and shifts its attention to the upper end of the market.

In this case it is shown in the Appendix that it is possible to find numerical values of the parameters that make MR preferable, from a global point of view, to FH. So we can now state the following.

Proposition 2. *If third party externalities are taken into account by the regulator(s), then an MR regime can be effective and it can yield a level of global welfare superior to the FH regime.*

Proof. The numerical example provided in the Appendix proves the proposition. *Q.E.D.*

Figure 3 represents the various equilibria of this model when $a \quad b \quad 1$, $t \quad 4$, $z \quad 8.8$ and externalities are described by expressions (34) and (35). The unregulated equilibrium (U) implies a minimum level of low quality (i.e.

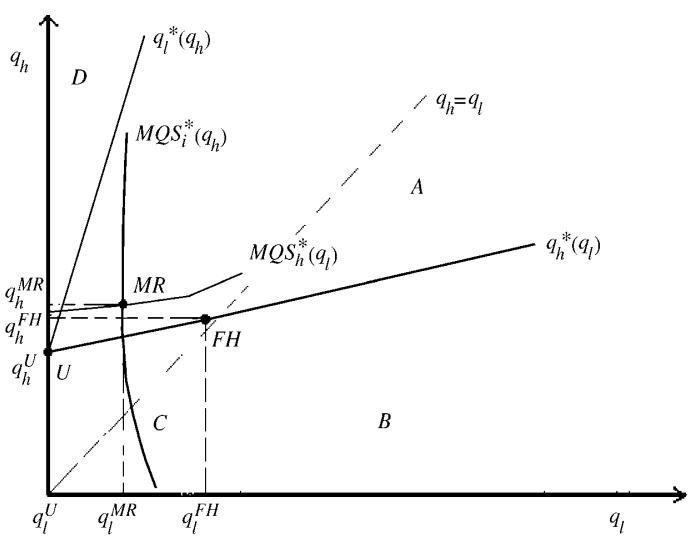

Figure 3 Equilibrium in Proposition 2 ($E \neq 0$).

(q_0 0). In this case the incentive effect of liability is not strong enough to dominate the rigid demand effect. In this situation the desirability of minimum quality regulation is very clear. FH raises low quality, but does not affect directly high quality choice, which is determined by the optimal response of the high quality auditor. MR affects directly both quality levels (the upper and lower end of the market) and generates an equilibrium quality mix (MR) which is located *inside* the region delimited by the two reaction functions. This equilibrium cannot be reached either with no regulation or with FH and delivers a level of global social welfare bigger than the one registered with FH. The 45° line represents the no differentiation case. As we can see from Figure 3 under MR quality differentiation is higher than under FH and high quality is higher under MR than under FH. These two facts together determine the superiority of MR because they visualize why this situation is preferable for the upper quality end of the market.[18]

5. CONCLUSIONS

A highly debated issue in the auditing industry, especially within the European Union, is whether auditing regulation should be conducted at the national level or at the international level. If we refer to the level of qualifications of the team of auditors as the measure of the quality of the audit, then the question of who has to decide the qualifications required to perform audits across the border is far from being solved. The Commission of the European Union has recently declared the following.

> There is no common view at EU level on the role, the position and the liability of the statutory auditor. The absence of such a common view has a negative impact on audit quality and . . . on the freedom of establishment and freedom to provide services in the audit field.[19]

Certainly the specific economic model used here cannot capture all the relevant aspects of the audit market. However, even within this relatively simple model, the effects of *ex ante* audit quality regulation on the different economic actors involved are fairly complex. These effects may be strictly related to the nature of the liability of the auditor and on the importance given to the issue of third party externalities. It has been shown that, in some particular cases, MR may be a superior solution at the global level.

Throughout the analysis I have taken the distribution of roles between the two auditors (*high* and *low*) as given. One of the consolidated results of the economic literature on product differentiation is that in an unregulated equilibrium profits are the same for both auditors. Hence, if we take the unregulated equilibrium as the starting point of the analysis of regulation, then it is less restrictive to assume the distribution of roles as exogenous. Obviously once regulation is in place, there would be an incentive to change role and 'leap frog' the rival auditor. So a natural extension of the analysis presented here would be to consider a dynamic version

of the model and study the possible relocation and/or repositioning effects that regulation can induce in the market for audit services.

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APPENDIX

Proof of Proposition 1 ($E = 0$)

We first consider the sign of the derivative of the national welfare function with respect of q_h along the best reaction function of the high quality auditor, i.e.

$$\left.\frac{\partial W_h}{\partial q_h}\right|_{(\partial \pi_h/\partial q_h)\ 0} \quad \left.\frac{1}{2}\frac{\partial CS}{\partial q_h}\right|_{(\partial \pi_h/\partial q_h)\ 0} \quad \frac{(b \quad 2aq_l \quad 7t)}{18} \geqslant 0 \Leftrightarrow q_l \leqslant \frac{b \quad 7t}{2a} \quad \hat{q}_l \tag{A1}$$

The two best reaction functions of the auditors cross at (q_l^U, q_h^U) and the parametric expression for this crossing point is given in the main text by equations (27a) and (27b). Notice that equations (27a) and (27b) always represent the *crossing point* of the two reaction functions but they do not always represent the *equilibrium level* of quality in an unregulated equilibrium. If the crossing point involves negative values, then 0 becomes the corresponding equilibrium level of quality. For the purpose of the proof of Proposition 1, what matters is the expression of the *crossing point* and its sign is irrelevant. It is easy to check that $\hat{q}_l < q_l^U$, i.e. the critical value for expression (A1) is located to the left of the crossing point of the best reaction functions of the two auditors.

Obviously at $q_l \quad \hat{q}_l$ the best reaction function of the high quality auditor and the best reaction function of the regulator of the high quality country have to cross. If $q_l > \hat{q}_l$, then for each q_h such that $q_h \quad q_h^*(q_l)$ we have that

$$\left.\frac{\partial W_h}{\partial q_h}\right|_{(\partial \pi_h/\partial q_h)\ 0} < 0$$

This implies that for $q_l \geqslant \hat{q}_l$ we have that $q_h^*(q_l) \geqslant MQS_h^*(q_l)$, i.e. the best reaction function of the high quality country national regulator must be below the best reaction function of the high quality auditor. Consequently we have q_h^{MR} $q_h^*(q_l^{MR})$ and for any $q_l \geqslant \hat{q}_l$ in an MR regime high quality level is determined by the best reaction function of the high quality auditor.

In the same way we can calculate a $\hat{q}_h$ such that for $q_h > \hat{q}_h$ we have that $q_l^*(q_h) \geqslant MQS_l^*(q_h)$. So for $q_h \geqslant \hat{q}_h$ in an MR regime low quality level is determined by the best reaction function of the low quality auditor.

So the best reaction functions of the national regulators can determine the MR equilibrium only for $q_l < \hat{q}_l < q_l^U$ (high quality country) and $q_h < \hat{q}_h < q_h^U$ (low quality country). However, in this region we have that $MQS_h^*(q_l) > q_h^*(q_l) > q_l^*(q_h) > MQS_l^*(q_h)$ and the best reaction function of the national regulators cannot cross.

So the MR equilibrium coincides with the unregulated equilibrium. For a graphical intuition of the argument the reader can refer to Figure 2.

Numerical example for Proposition 2

Equations (34) and (35) imply the following externality function:

$$E(q_l, q_h) \quad z\frac{q_l + q_h}{2} \quad z > 0 \tag{A2}$$

Imposing a b 1 and t 4 we get the following global welfare function:

$$\begin{aligned} W(q_l, q_h) \quad & \tfrac{3}{8}q_l \quad \tfrac{1}{12}q_l^2 \quad \tfrac{5}{72}q_l^2 q_h \quad \tfrac{5}{72}q_l^3 + \tfrac{21}{8}q_h \quad \tfrac{11}{12}q_h^2 + \tfrac{5}{72}q_h^3 \\ & + \tfrac{5}{72}q_l q_h^2 \quad \bar{D} + z\frac{q_l + q_h}{2} \end{aligned} \tag{A3}$$

By plugging in the best reaction function of the high quality auditor and taking the first derivative w.r.t. q_l we obtain:

$$\frac{\mathrm{d}W}{\mathrm{d}q_l} \quad \tfrac{2}{3} + \tfrac{2}{3}z \quad \tfrac{20}{81}q_l^2 \quad \tfrac{10}{27}q_l \quad 0 \Rightarrow q_l \quad \tfrac{3}{4} + \tfrac{3}{20}\sqrt{5}\sqrt{29 + 24z} \tag{A4}$$

If we substitute z 8.8 we get q_l^{FH} 4.44832 $\cong$ 4.45. Using the reaction function of the high quality auditor we get q_h^{FH} $q_l^*(q_l^{FH})$ 4.48277 $\cong$ 4.48.

Moving to the MR regime we have

$$\begin{aligned} W_l \quad & \tfrac{19}{16}q_l + \tfrac{5}{16}q_h \quad \tfrac{1}{8}q_h^2 + \tfrac{5}{144}q_h^3 \quad \tfrac{5}{144}q_l^3 \quad \tfrac{1}{2}\bar{D} + \tfrac{5}{144}q_h^2 q_l \quad \tfrac{5}{144}q_h q_l^2 \\ & \tfrac{3}{8}q_l^2 + \tfrac{1}{2}\left(z\frac{q_h + q_l}{2}\right) \end{aligned} \tag{A5}$$

Then

$$\frac{\partial W_l}{\partial q_l} \quad \frac{19}{16} \quad \frac{5}{48}q_l^2 + \frac{5}{144}q_h^2 \quad \frac{5}{72}q_h q_l \quad \frac{3}{4}q_l + \frac{1}{4}z \quad 0 \tag{A6}$$

from which

$$MQS_l^*(q_h) \qquad \frac{1}{3}q_h \quad \frac{18}{5} + \frac{1}{15}\sqrt{100q_h^2 + 540q_h + 5481 + 540z} \tag{A7}$$

Analogously

$$W_h \quad \frac{37}{16}q_h \quad \frac{5}{144}q_h q_l^2 + \frac{5}{144}q_h^2 q_l \quad \frac{19}{24}q_h^2 + \frac{7}{24}q_l^2 \quad \frac{13}{16}q_l \quad \frac{5}{144}q_l^3 + \frac{5}{144}q_h^3 \quad \frac{1}{2}\bar{D} + \frac{1}{2}\left(z\frac{q_h + q_l}{2}\right) \tag{A8}$$

$$\frac{\partial W_h}{\partial q_h} \quad \frac{37}{16} \quad \frac{5}{144}q_l^2 + \frac{5}{72}q_h q_l \quad \frac{19}{12}q_h + \frac{5}{48}q_h^2 + \frac{1}{4}z \quad 0 \tag{A9}$$

$$MQS_h^*(q_l) \qquad \frac{1}{3}q_l + \frac{38}{5} \quad \frac{1}{15}\sqrt{100q_l^2 \quad 1140q_l + 8001 \quad 540z} \tag{A10}$$

If we substitute $z \quad 8.8$ and we solve for $MQS_h^*(q_l) \quad MQS_l^*(q_h)$ we obtain

$$q_l^{MR} \quad 3 \quad \text{and} \quad q_h^{MR} \quad 4.8 \tag{A11}$$

Then

$$W\left(q_l^{MR}, q_h^{MR}\right) \quad 33.78 \quad \bar{D} > 32.854 \quad \bar{D} \quad W\left(q_l^{FH}, q_h^{FH}\right) \tag{A12}$$

NOTES

1 In an FH regime the standard could be set by an international regulatory body, e.g. the International Auditing Practices Committee (IAPC) of the International Federation of Accountants.

2 The extent to which an auditor owes a duty of care to third-party users of the accounts is a controversial issue. In all the EU countries the auditor is exposed to civil liability, but the scope of this liability varies. It always covers the contractual parties, i.e. the auditee company, but it does not necessarily involve third parties; see Buijink *et al.* (1996: Section 2.3.7) and Gwilliam (1997). The paradox of requiring a mandatory audit and then denying the duty of care to third parties is clearly expressed by Grout *et al.* (1994): 'Of course, it is common knowledge (even to the courts) that the accounts serve a larger purpose in informing investment decisions, and moreover, this further

purpose may justify having a statutory requirement for independently audited accounts but then why deny these third parties the protection of the law?'

3 The meaning of audit quality in this model is slightly different from the meaning it takes in many of the models of the audit relationship already existing in the literature. In those models (e.g. Dye, 1993a) q is seen as the level of *effort* provided by the auditor and it is assumed to be verifiable in court *ex-post*, but not observable and/or contractible *ex-ante.* This is all that matters when the object of the analysis is the incentive effect of the liability system. However, here the focus is on *ex-ante* regulation of audit quality.

4 We can think of θ as the valuation effect associated with conducting and disclosing an audit. The audit is often seen as a signal sent to investors that affects the valuation they give to the company. Hence a higher θ means that, for a fixed level of audit quality, the valuation effect is higher. The valuation effect of the audit is often quoted as one of the drivers of the demand for audit services. Falk and Lally (1998) have formally modelled the demand for audit services starting from this assumption.

5 In particular we need to assume that the profit functions are differentiable and concave.

6 Narayanan (1994) correctly points out that the incentive effect of the liability regime is as important as the absolute effect. Suppose we are comparing a joint and several liability regime with a proportional liability regime. The level of maximum liability payments that an auditor can be asked to pay in case of bankruptcy of the client is higher under joint and several liability. However, under joint and several liability an increase in the quality of the audit provided only reduces the probability of being held liable, but it does not affect the amount of the payment in case the auditor loses the case. On the other hand, under a proportional liability regime an increase in audit quality decreases both the probability of being held liable *and* the amount of the payment in case the auditor loses the case. In the model presented here the case of joint and several liability implies a constant D, whereas the case of proportional liability implies a D decreasing in q.

7 This cost function is similar to the one used by Dye (1993a), Willekens *et al.* (1996) and Frantz (1999).

8 This condition guarantees that marginal cost is always positive. The quadratic form has been used extensively in the economic literature. See, e.g., Ecchia and Lambertini (1997) or Scarpa (1998).

9 Cf., e.g., Dye (1993a), Naranyanan (1994) and Ewert (1999). In all these models, if we eliminate the liability effect, then audit quality choice in equilibrium is at the minimum. This is due to the fact that without liability effects, audit quality choice becomes a physical cost minimization activity and this fact delivers the minimum possible level as the optimum choice.

10 Generally speaking the value of b will depend on the probability of a failure and misstatement in the accounts (s) and the legal systems (shape of $\eta(\cdot)$), i.e. $b(s, \eta)$ with $b(0, \eta)$ 0 and $b(s, 0)$ 0.

11 The proof is available from the author.

12 The symmetry and uniform distribution assumptions are standard in the economics literature on product differentiation. They are quite strong, but they bias the model towards FH. As we have seen in the previous section the key to the possible superiority of MR is a strong preference for high quality and/or a possible difference between countries in favour of the high quality country. So if we can show that MR can be superior in a symmetric case then *a fortiori* it should be superior if we assume that demand is skewed towards high quality (high θ's) and/or when the high quality audit country is smaller. At the other end, when clients' demand is skewed towards low quality (low θ's) and/or when the high quality audit country is bigger, then FH is more likely to be the dominant regime.

13 Equation (21) implies that given a certain price, the client always prefers high quality to low quality. This assumption may be questioned when we refer to (unobservable) audit *effort*. In this case a client who has something to hide may prefer low effort to high effort. But if we focus on observable features of the quality of the audit firm engaged, then even a negligent client still prefers to engage an audit firm of the highest possible quality, because of the signalling effects of such an engagement. They will then try to collude with the auditor in order to manipulate the final audit report.

14 Given the assumptions on the distribution of consumers, this market would not be automatically covered in equilibrium. One of the consequences of Assumption 1 is that in equilibrium total clients' welfare may be negative. However, clients' *welfare* must not be confused with clients' *profits*. Clients' welfare is simply the utility derived from the audit report. So a negative level of utility can be loosely interpreted as an audit *tax* the client has to pay because of the imposition of mandatory audit.

15 If $0 \leqslant b \leqslant t/4$ the two reaction functions would cross on the negative side of the q_0 axis. Given that this is not possible, in this case the equilibrium level of low quality is constrained at 0 and the equilibrium level of high quality is determined as the best response to a 0 low quality level.

16 For a survey, cf. Gwilliam (1997).

17 Cf. the Appendix.

18 However in the numerical example used to prove Proposition 2 we have that $W_0(MR) > W_0(FH)$ whereas $W_h(MR) < W_h(FH)$. So a shift from FH to MR benefits the low quality auditor country and harms the high quality auditor country. Hence the implementation of an MR regime may depend crucially on the ability to reach an agreement on some mechanism of international compensation between countries. I am very grateful to one of the referees for raising this point.

19 Cf. EU Commission (1996, 1998).

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